If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

1.5 Electrical Safety Implementation Plan

Text Pages 2 through 7

Attachments

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Chairman Date

J. Sandberg, P. Cirnigliaro

1.5 Electrical Safety Implementation Plan

1. Purpose

This procedure outlines plans that are followed in order to assure Electrical Safety. It covers formal requirements and describes techniques that shall be employed to increase the level of electrical safety awareness of all personnel who work on electrical equipment.

2. Responsibilities

2.1 The Chief Electrical Engineer, or his designee, shall spearhead the drive for Electrical Safety in the Department and is responsible for implementation of this procedure.

2.2 E.E. (Sectional) Group Leader - The C-A comprises several Electrical Engineering Groups as listed in the C-A Organization Chart. It shall be the responsibility of the Group Leader of each section to promote a safe environment within his/her group, and to see that all members of the group are trained and certified in the equipment for which they are responsible.

2.3 (Electrical) Supervisors - are responsible for maintaining safe working areas, for the training of all individuals in their group, for ascertaining that all individuals in their group have electrical safety training that is up-to-date, and for insuring all job assignments are evaluated using C-A-OPM 2.28, "C-A Procedure for Work Planning and Control for Operations".

3. Prerequisites

All personnel involved in working on any electrical system or equipment in the C-A shall be familiar with BNL ES&H Standards 1.5.0, 1.5.1, and 1.5.2. C-A will provide on-site/work specific training to individuals in the electrical safety aspects of their job functions and assignments.

4. Precautions

All personnel shall ensure their own safety by following the standards, safety rules, and the training they receive. In general, all energy sources must be locked out and tagged. "Working hot" is not permitted unless a valid working hot permit has been issued. Personnel shall utilize tools, instruments, equipment (e.g., proper connectors and proper ac line cords), etc., that are safe and proper for the job. If any part of a job appears unsafe to any individual, it is their duty to discontinue work and inform the supervisor, manager, ESH Coordinator or the C-A ESHQ Division Head, of the unsafe condition.

5. Procedure

The following sections outline the procedure that shall be followed by all C-A personnel working on electrical equipment or apparatus connected to electrical energy sources.

5.1 Training

5.1.1 All C-A electrical personnel shall be trained in this procedure.

5.1.2 All employees involved in electrical work in the Department shall be trained both in electrical safety, Lockout/Tagout, BNL ES&H standards 1.5.0, 1.5.1, and in the equipment they work on. Supervisors shall ensure that all personnel assigned to them (including outside visitors) shall have current verified training and that proper techniques are being followed in the work place.

5.2 Safe Working Practices

5.2.1 All individuals shall follow good working practices. Equipment shall be rated for the application and shall be protected for the use. Improper equipment, tools, cables, connectors, etc., shall NOT be used. Wherever possible, defective equipment or components shall be destroyed or discarded.

5.2.1.1 All new cables shall be clearly labeled at both ends to allow for easy and positive identification.

5.2.1.2 When installing new or disconnecting old cables, the cables shall be positively identified by testing to verify that the same cable is being handled at each end.

5.2.1.3 Disconnected cables shall be completely removed or clearly labeled at both ends (e.g., Do Not Use, etc.) until it is removed. Both ends of the unused cable shall be properly terminated (i.e., covered or capped) to prevent personnel injury or shock hazards.

5.2.2 The most important aspect of electrical safety is lockout/tagout, which guarantees that ALL energy sources for a piece of equipment have been secured before work shall begin. All equipment shall be designed, constructed, or procured so that LOTO can be accomplished. All personnel working on electrical equipment shall strictly follow the above guidelines and the training that they receive.

5.2.3 It is the responsibility of the project engineer/physicist, the group leader, and the Chief EE to ensure all work that involves installing, moving, or adding electrical power must include the labeling of circuit breakers and/or disconnect switches and cables as part of the work package.

5.2.3.1 If equipment is powered from a remote breaker or disconnect switch, (i.e. another building or a location judged to be confusing to operating personnel), the equipment itself shall be labeled with information describing the location of its supply breaker/disconnect switch.

5.2.4 The work planner shall evaluate all jobs against criteria in C-A-OPM 2.28, "C-A Procedure for Work Planning and Control for Operations".

5.3 Safety Inspections

5.3.1 It shall be the responsibility of the EE (sectional) Group Leader and the area (Electrical) supervisor to routinely inspect the physical areas under their control and the major equipment designed and/or maintained by their Group.

5.3.2 The C-A Safety Inspection Committee shall conduct safety inspections of all areas on a regular basis. The C-A Chief Electrical Engineer shall assign at least one member to this committee who will accompany the inspection tours. This member shall aid in the inspection of electrical equipment. A list of findings from the inspections shall be sent to the C-A Chief Electrical Engineer by the Committee Head or designee. If an item or finding requires an electrical engineering review or certification then a memo shall be sent to the C-A Chief Electrical Engineer by the Committee Head requesting a review.

5.4 Department Design Reviews

As defined by the C-A criteria, all new projects and major modifications to existing equipment shall undergo design reviews, if procured by the C-A Department. As part of this review, electrical safety criteria shall be covered to assure adherence to OSHA requirements described in BNL ES&H Standards 1.5.0, 1.5.1, 1.5.2. This is not in lieu of but in addition to the review of all safety issues covered by the C-A Accelerator System Safety Review Committee or the Experiment Safety Review Committee.

It is the responsibility of the project engineer/physicist, the Group Leader and the Chief EE to ensure that all changes are safe.

All design changes or implementations to systems shall be covered by official Engineer Change Notice (ECN's).

5.5 Testing Areas

All C-A high-power equipment shall undergo testing with proper barriers in place and with adequate safety zones for the equipment as well as the load. Safety interlocks and crash buttons shall be employed where appropriate.

5.6 Unusual Event Investigation

A system exists for the formal investigation of Reportable Occurrences. There are, however, incidents or situations that do not meet the criteria for a formal investigation or for which Department or Divisional Management request additional information. These events will be investigated by the Chief EE, or designee, for their safety related content.

5.7 Electrical Safety Procedures

Lockout/Tagout procedures shall be used whenever possible when maintenance or construction is performed on equipment that has the potential for energy release.

Although it is Department policy to use LOTO when working on electrical equipment, there are circumstances that require working on energized equipment. To meet the requirements of ES&H Standard 1.5.0:

5.7.1 The Department requires that any supervisor, who ascertains the need for not applying LOTO to perform certain tasks, must write a procedure and a permit following ES&H 1.5.0. The supervisor may consult with the ESHQ Division for assistance.

5.7.2 Range B Generic Permits:

A generic procedure and permit can be written for Range B electrical hazards. The criteria for this range are:

AC>50 vRMS<250v RMS and/or DC > 50v <1000v.

5.7.2.1 Conditions

Training must be relative to the task performed (i.e. personnel must be trained in the procedure that was written for the job.) A control Zone for the work area must be established in accordance with accepted practice.

5.7.3 Range C Generic Permits:

A generic procedure can be written for Range C electrical Hazards. The criteria for range are:

AC>250vRMS <600v RMS and/or DC>1000v<6000v.

Note:
For this range a new permit must be issued every time the procedure is used.

5.7.3.1 Conditions

Training must be relative to the task performed (trained in the procedure written). A Safety watch for this Range of Hazard is required. A Control Zone for the work area must be established in accordance with accepted practice.

5.7.4 Obtain Chief EE and/or ESHQ Division Head signed approval of the procedure before training personnel. For certain conditions C-A standing generic procedures can be used (see Section 5.8).

5.7.5 The C-A Training and Procedures Manager will maintain a file/data base of all personnel trained in electrical safety.

5.7.6 The permit will be: filled out, signed by the supervisor, and presented to the Chief EE for approval to proceed with the work.

5.7.7 The permit shall be posted at the Job Site.

5.8 C-A Standing Generic Permits

The C-A using BNL ES&H Standard 1.5.0, has written two generic Range B Hazard procedures and issued generic permits for use by personnel with C-A verified training.

5.8.1 "Testing and Diagnosing while Energized" allow personnel to test, check and "trouble shoot" equipment under very controlled conditions but without manipulating any energized components or wiring (see C-A-Safety Procedure 15.17.99.99).

5.8.2 "Manipulating while Energized" allow personnel to repair and change wiring in certain "Critical Circuits" under very controlled conditions (see C-A-Safety Procedure 15.17.99.98). The Department Chair has identified the following circuits as Critical Circuits, where de-energizing the circuits

could create a greater hazard than would working hot. Only these circuits can be worked on using the "manipulating while energized" procedure.

_ C-A Access Security System
_ C-A Fire Protection System
_ C-A Ring, Experimental Building and Cave Ventilation Control Systems
_ C-A and Experimental Areas, Cryogenic Target Controls and Monitors
_ Uninterruptible Power System Modules for Control Room (to enable communications), Security, Ventilation and Fire Protection Control Systems
_ C-A Control Room Lighting Systems
_ C-A Main Magnet Power Supply battery control section
_ Uninterruptible Power Supply battery sections

6. Documentation

6.1 Safety Inspection Committee Surveys - The copies of the safety inspection reports performed by the Department Safety Inspection Committee will be made available to the Group Leader and Supervisor of each of the Engineering Groups.

6.2 Training Records – The C-A Training and Procedure Manager shall maintain all training records.

6.3 Specific equipment training lists – The C-A Supervisors shall maintain lists of all their assigned personnel and the equipment for which they have been trained (OJT checklists).

6.4 Maintenance and Operating Procedures - All new equipment and major modifications to existing equipment shall be fully covered by maintenance and operating procedures. Each area shall keep a current list of all applicable procedures for each of their systems.

6.5 Electrical Safety Procedures and Permits - The Training and Procedures Manager shall maintain a file/data base of personnel trained in Electrical Safety Procedures.

6.6 The C-A Chief Electrical Engineer shall maintain a file of issued Working Hot Permits.

7. References

7.1 C-A-OPM 2.28 “C-A Procedure for Work Planning and Control for Operations”.
7.2 BNL ES&H Standards 1.5.0, 1.5.1, 1.5.2.
7.3 OSHA 29 CFR 1910.
7.4 C-A QA Manual.
7.5 C-A-Safety Procedure 15.17.99.99.
7.6 C-A-Safety Procedure 15.77.99.98.

8. Attachments

None